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TEST DATA ON THE SHEAR STRENGTH OF JOINTS ASSEMBLED WITH ROUND-HEAD AND BRAZIER-HEAD RIVETS

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WASHINGTON

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RESTRICTED BULLETIN

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A series of load-displacement curves obtained from tests in shear of joints riveted with round-head (AN430) and brazier-head (AN455) rivets is presented. A set of curves is also presented comparing the tightness of the two types of rivet for one value of rivet diameter. The specimens used in these tests consisted of two sheets of 24S-T aluminum alloy riveted together in the form of a lap joint with two A 17S-T aluminum alloy rivets, as shown in figure 1. The round or brazier head of the rivet was driven with a vibrating gun while the shank end was bucked with a bar.

Loads were applied to the specimens through Templin grips with a hydraulic testing machine accurate within one-half of 1 percent. Displacements of one sheet with respect to the other were measured on the edges of the sheets opposite the center of the riveted joint by means of two 18-power microscopes with filar micrometers. Both the displacement under load and the permanent displacement after removal of the load were measured for successively increasing loads until failure occurred.

RESULTS

The load-displacement curves were plotted for all specimens tested. (See figs. 2 to 6.) The shear loads per rivet corresponding to permanent displacements of 0.01d, 0.02d, 0.03d, 0.04d, and 0.05d, where d is rivet diameter, were determined from these curves and are listed in table I.

Figure 7 shows a comparison of the load at various values of permanent displacement for 1/8-inch-diameter round-head and brazier-head rivets. The value of load at a given value of permanent displacement provides a measure of the tightness of the joint. Figure 7 therefore indicates

that, for sheet thicknesses of 0.064 and 0.081 inch, the use of 1/8-inch brazier-head rivets produces a tighter joint in shear than does the use of 1/8-inch round-head rivets. For a sheet thickness of 0.025 inch, the round-head rivets are tighter than the brazier-head rivets. For sheet thicknesses of 0.032 and 0.040 inch, the two types of rivet are of about equal quality with regard to tightness. No comparative tests were made with sheet thicknesses less than 0.025 inch or greater than 0.081 inch, or with rivets of diameters other than 1/8 inch.

Hardness tests of representative samples of each of the two types of rivet showed that they were of about equal hardness, and therefore that the other material properties for the two types were probably also about equal.

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TABLE I

EXPERIMENTAL DATA FROM TESTS OF JOINTS RIVETED WITH ROUND- AND BRAZIER-HEAD RIVETS

Specimen Number	Type of rivet head	Rivet diameter, d (in.)	Drill no.	Sheet thickness, t (in.)	Ratio d/t	Load per rivet (lb.)					Maximum load per rivet (lb.)	Type of Failure
						Permanent displacement of 0.01 d	Permanent displacement of 0.02d	Permanent displacement of 0.03d	Permanent displacement of 0.04d	Permanent displacement of 0.05d		
19-3	Round	3/32	41	0.025	3.75	200	215	220	225	230	246	a
19-4				.032	2.93	210	225	240	245	245	250	a
19-5				.040	2.34	210	220	235	240	245	252	a
19-6				.051	1.84	235	255	260	265	270	274	a
19-7				.064	1.46	230	245	255	260	---	264	a
19-9	Round	1/8	30	.025	5.00	310	340	355	365	370	406	b
19-10				.032	3.90	355	370	395	400	410	442	b
19-11				.040	3.12	340	370	390	400	405	419	a
19-12				.051	2.45	330	360	375	385	390	418	a
19-13				.064	1.95	330	360	375	390	395	418	a
19-14				.081	1.54	300	335	350	365	375	404	a
19-15	Round	5/32	21	.025	6.25	380	415	430	430	---	445	c
19-16				.032	4.87	475	535	565	580	595	667	b
19-17				.040	3.90	520	575	605	625	640	698	b
19-19				.064	2.44	585	655	680	690	695	725	a
19-20				.081	1.93	580	635	655	670	675	695	a
19-22	Round	3/16	11	.032	5.85	620	660	675	678	---	715	c
19-23				.040	4.68	685	740	770	795	810	865	c
19-24				.051	3.69	725	780	820	845	870	925	a
19-25				.064	2.93	740	800	835	860	880	917	b
19-27				.102	1.83	730	790	830	860	880	917	b
19-30	Brazier	1/8	30	.025	5.00	300	330	340	345	350	391	cb
19-31				.032	3.90	350	380	398	410	417	452	b
19-32				.040	3.12	350	375	390	405	410	446	a
19-34				.064	1.95	360	390	405	415	420	432	a
19-35				.081	1.54	350	370	400	410	415	429	a

a. Pure shear of rivets.

b. Shear of rivets and bearing of sheet.

c. Tensile failure of sheet adjacent to rivet.

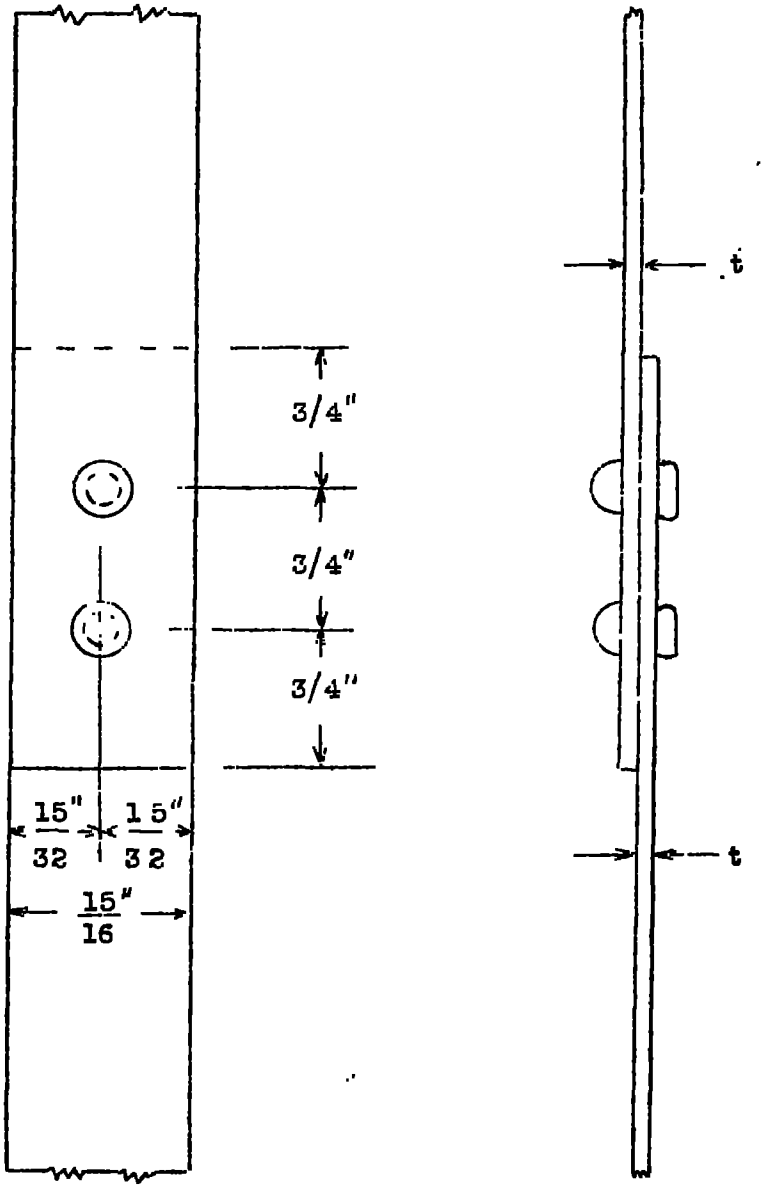

Figure 1.- Test specimen.

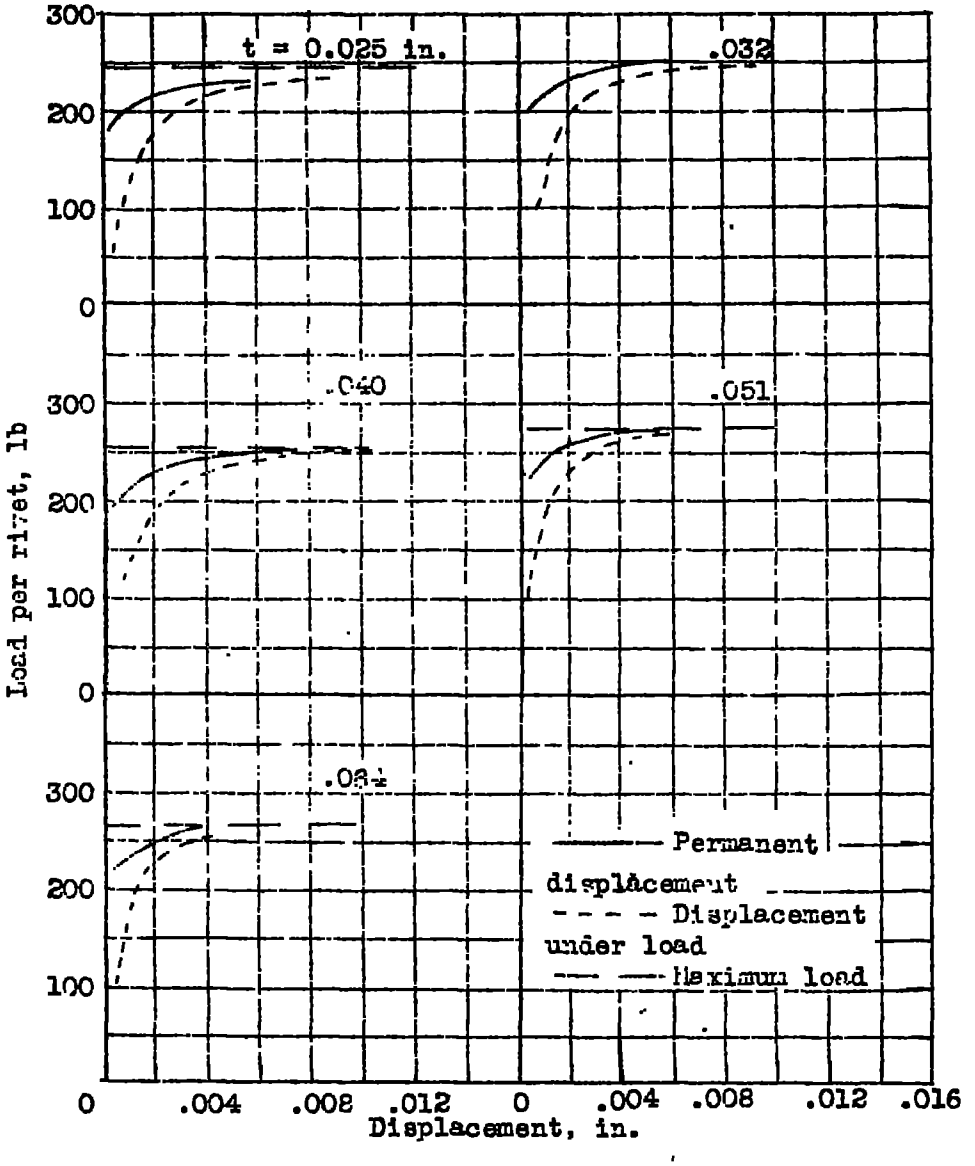

Figure 2.- Load-displacement curves. Round-head rivets 3/32-inch in diameter.

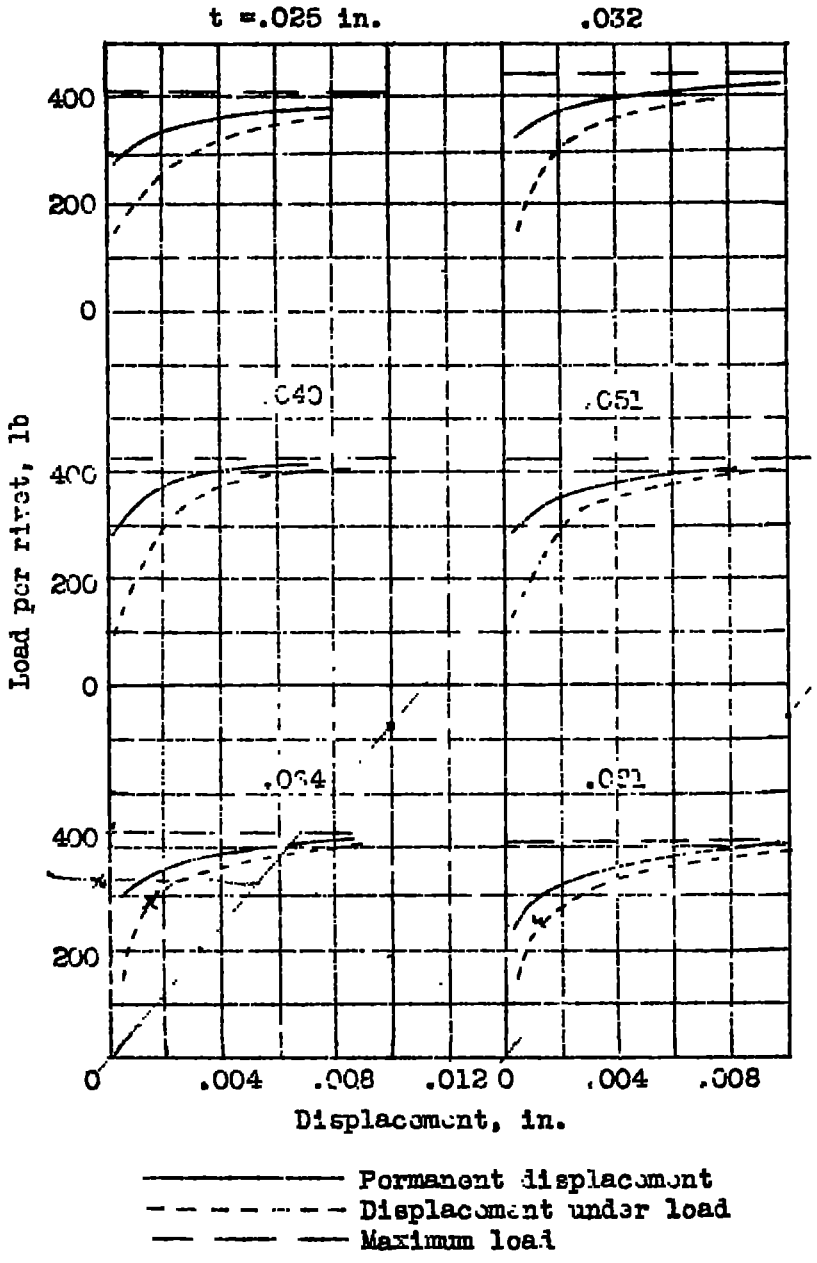

Figure 3.- Load-displacement curves. Round-head rivets 1/8 inch in diameter.

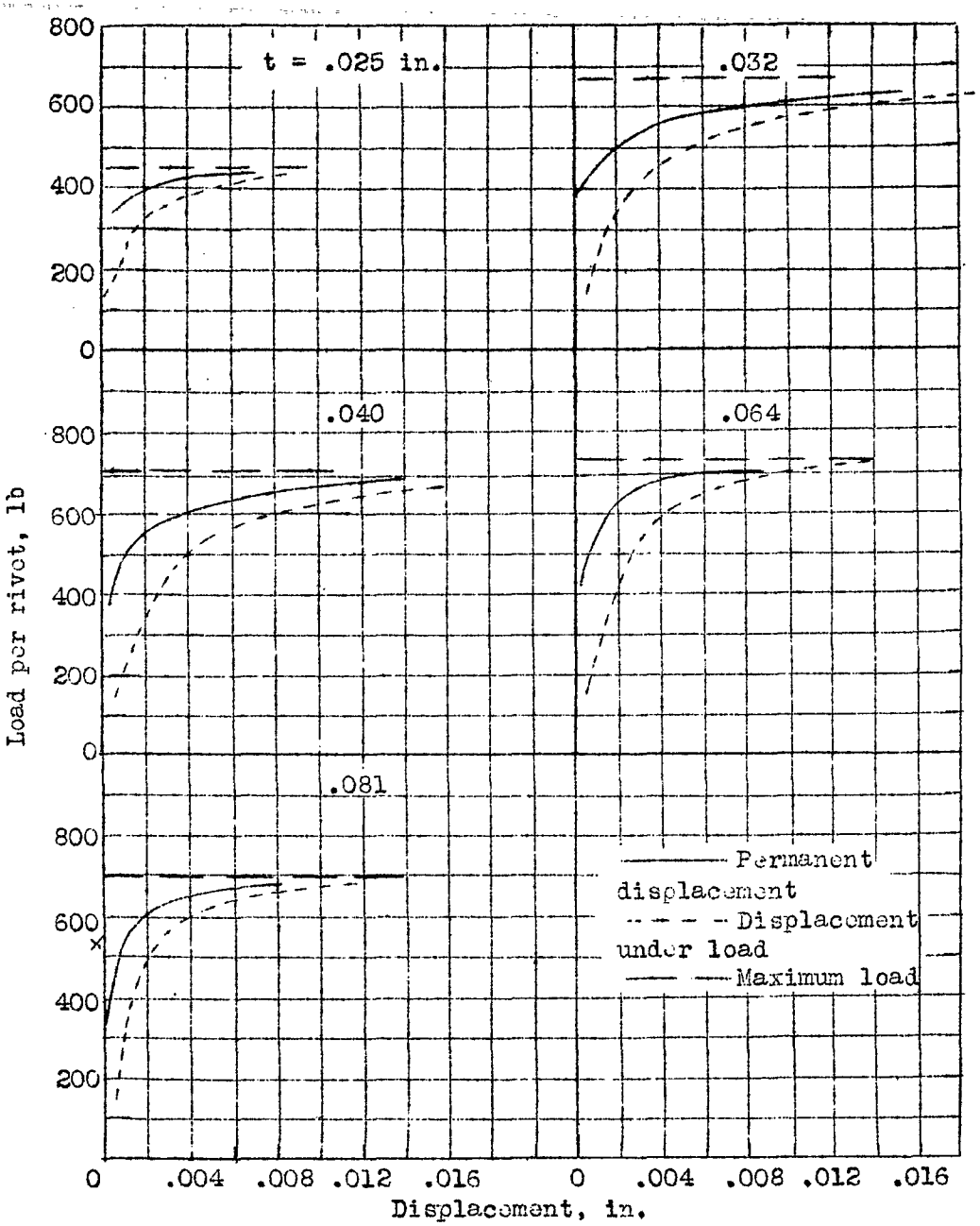

Figure 4.- Load-displacement curves. Round-head rivets 5/32 inch in diameter.

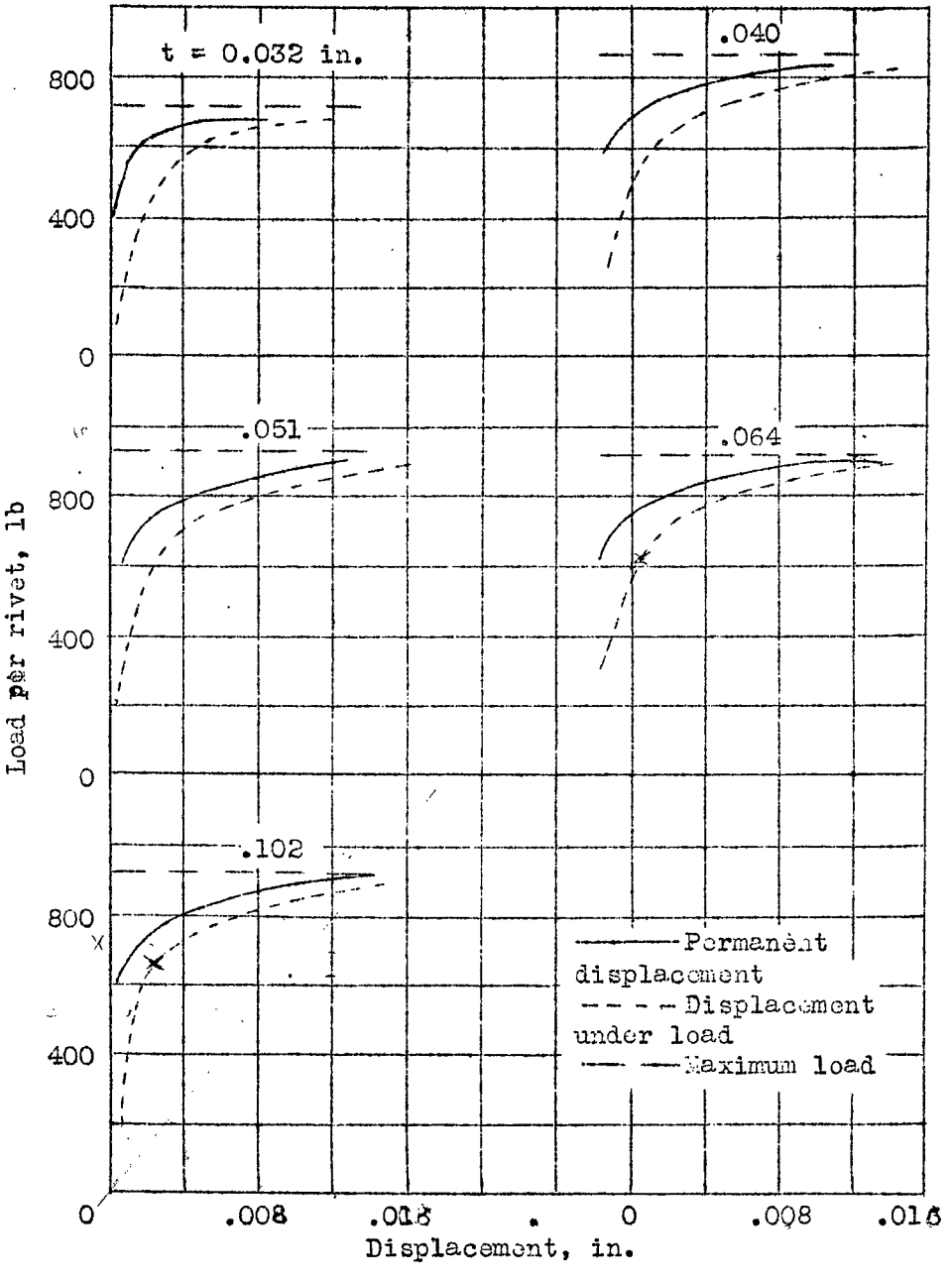

Figure 5.- Load-displacement curves. Round-head rivets 3/16-inch in diameter.

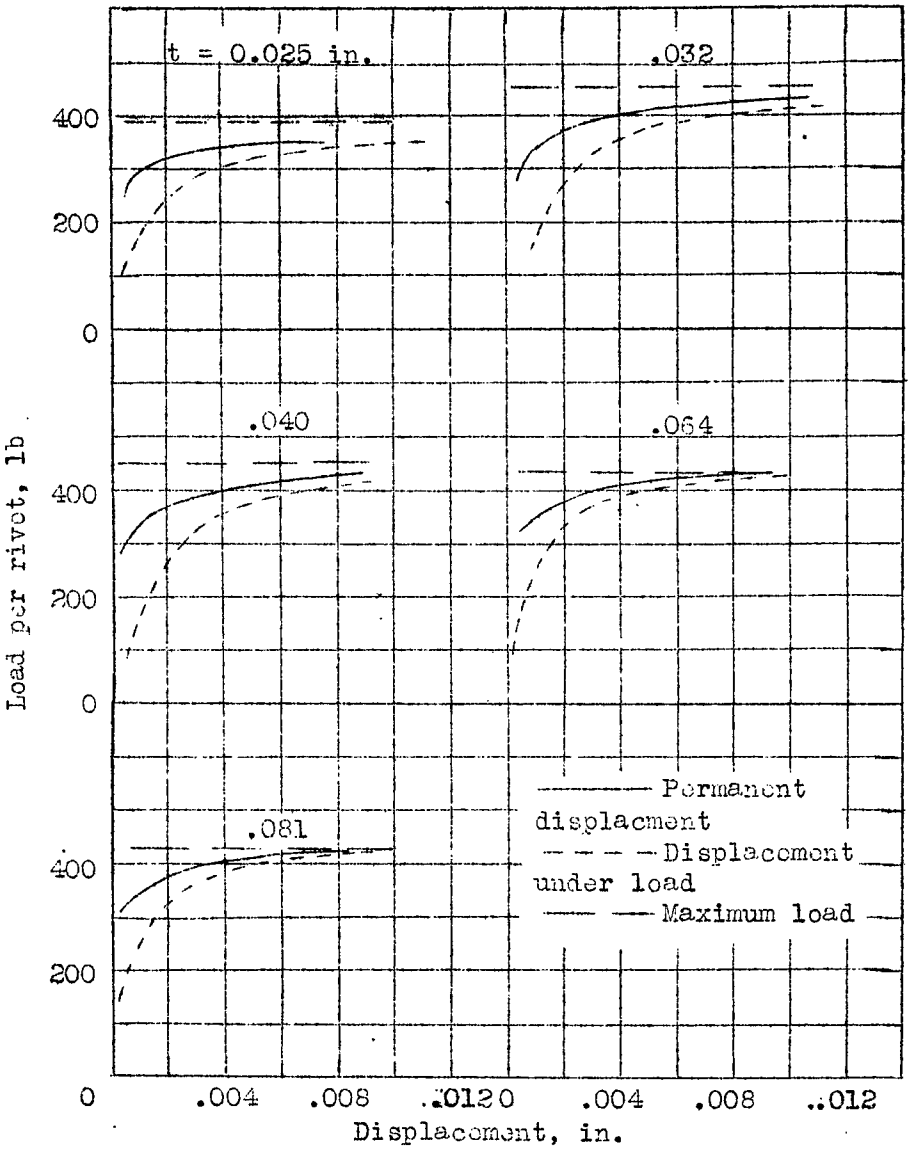

Figure 6.- Load-displacement curves. Brazier-head rivets 1/8-inch in diameter.

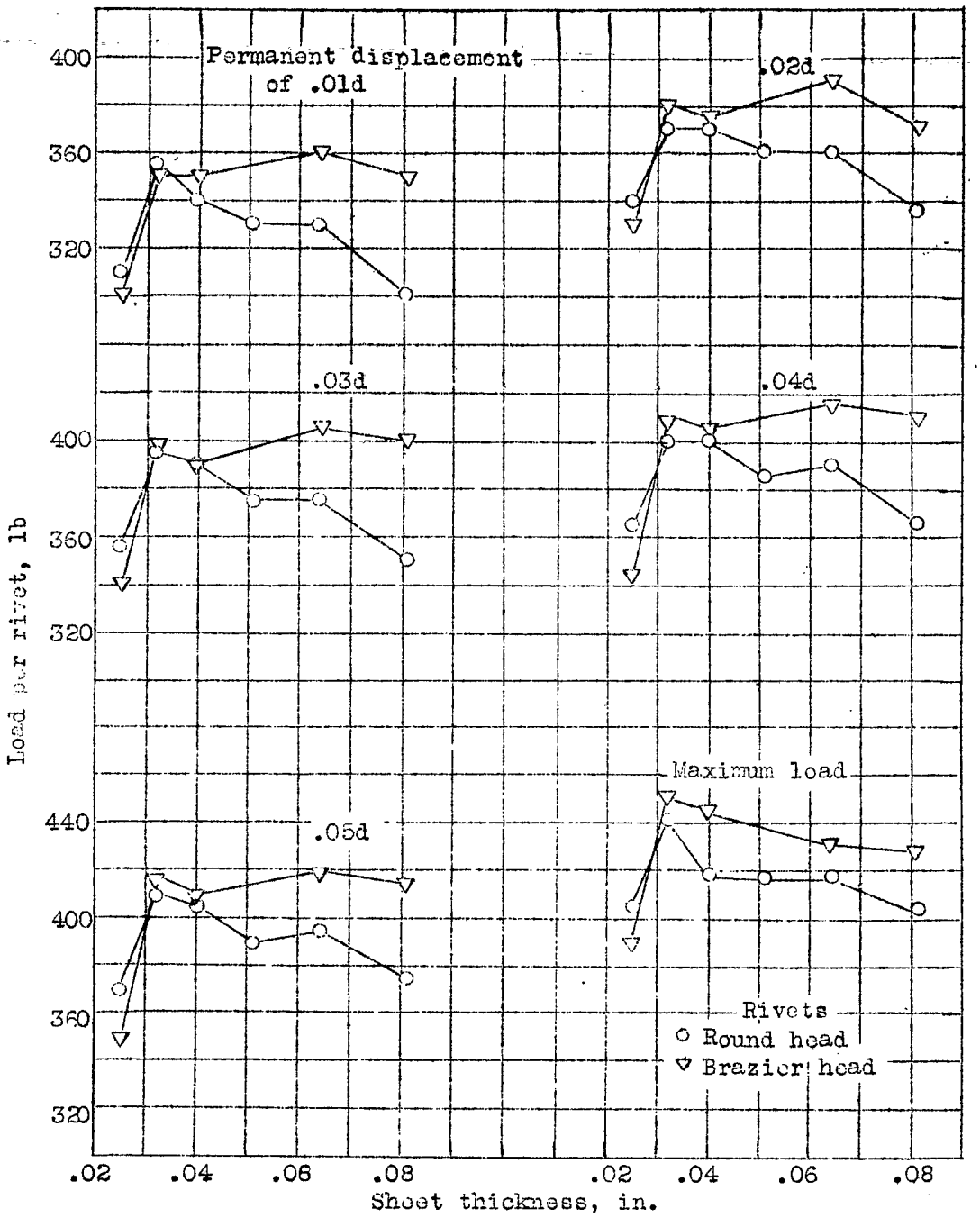

Figure 7.- Comparison of load at various values of permanent displacement for 1/8-inch diameter round-head and brazier-head rivets.